DOCUMENT RESUME

ED 186 864 CS 005 447

AUTHOR Waterhouse, Lynn H.; And Others
TITLE Language Awareness and Reading. IRA Series on the Development of the Reading Process.
INSTITUTION International Reading Association, Newark, Del.
PUB DATE 80
NOTE 69p.
AVAILABLE FROM International Reading Association, 800 Barksdale Road, P.O. Box 8139, Newark, DE 19711 (Order No. 525, $2.25 member, $3.50 non-member)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Cognitive Development; Concept Formation; Developmental Psychology; *Developmental Stages; Early Childhood Education; *Language Acquisition; Language Attitudes; Language Skills; Psycholinguistics; Reading Instruction; *Reading Processes; Reading Research; Reading Skills; Teaching Methods
IDENTIFIERS *Metalinguistics

ABSTRACT

The relationship between children's language and their knowledge of the various features of their language and their reading is examined from the perspective of several prominent theories about the link between thought and language. The first chapter contrasts features of five significant contemporary theories of language and thought--the Russian, Whorfian, Piagetian, psycholinguistic, and semiotic extension theories--and shows how each constrains a general model of the reading process and how each suggests various reading pedagogies. The second chapter focuses on the connection between universal competence claims of psycholinguistic theories and the actual language performance of children. The final chapter critically reviews research evidence about the development of a child's awareness of language from the perspective of what level, if any, of linguistic awareness is needed for initial reading. (FL)

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ED108894

ira series on the development of the reading process

LANGUAGE AWARENESS AND READING

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Edited by Frank B. Murray
University of Delaware

Published by
INTERNATIONAL READING ASSOCIATION
800 Barksdale Road Newark, Delaware 19711

CS503247

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Library of Congress Cataloging in Publications Data

Waterhouse, Lynn H.
Language awareness and reading.
(IRA series on the development of the reading process) Includes bibliographies.
1. Reading. 2. Language awareness. 3. Thought and thinking. 4. Competence and performance (Linguistics). 5. Language acquisition.
I. Fischer, Karen M., joint author. II. Ryan, Ellen Bouchard, joint author. III. Murray, Frank B. IV. Title. V. Series: International Reading Association. IRA series on the development of the reading process.
LB1050.W36 372.4 80-10842
ISBN 0-87207-525-7

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Foreword

It is particularly fitting that the International Reading Association should publish this *Series on the Development of the Reading Process* for the volumes in this series exemplify the value of reading—the value of the printed word. The Series originated in a four-week summer institute at the University of Delaware. Those fortunate people who were able to participate in the institute counted it an enriching experience. How does one share such an experience at a reasonable cost with thousands of others who will wish they might have been present to participate? Through the medium of print. In this IRA series, participation in that unusual institute is available to all interested readers.

The volumes in this series represent more than just a series of papers presented at the institute. They incorporate ideas raised in the discussions at the institute and new developments interpreted through perspectives engendered by the institute.

This *Series on the Development of the Reading Process* deals with important basic issues that are fundamental to understanding the changing nature of the reading process as both the process and the child develop. In the literature on reading, these issues—such as the development of the child's cognitive abilities, the development of the child's semantic system, the child's changing conceptions of language, and the developing relation between listening and reading—are often referred to knowingly as if they are well understood or as if mere reference to them will prove a point. In this series, however, each volume deals with one such basic issue in a comprehensive way and specifically in relation to learning to read.

The person with the vision to develop the institute and with the wisdom and commitment to see that the fruits of the institute were made available to others is Frank B. Murray, editor of this series. The International Reading Association and all who value a deeper understanding of the development of the ability to read are indebted to him for his vision and his labor.

WALTER H. MACGINITIE

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The International Reading Association attempts, through its publications, to provide a forum for a wide spectrum of opinion on reading. This policy permits divergent viewpoints without assuming the endorsement of the Association.

Preface

In this fifth monograph in the series on the development of the reading process, the relationship between the children's awareness and knowledge of the various features of their language and their reading are examined from the perspective of some prominent theories about the link between thought and language.

In the first chapter of this monograph, Lynn Waterhouse portrays the contrasting features of five significant contemporary theories of language and thought—the Russian, Whorfian, Piagetian, psycholinguistic, semiotic extension theories—and shows how each constrains a general model of the reading process and how each suggests various reading pedagogies. Because of the critical dependence of reading upon language and thought any adequate explanation of the development of the reading process must either introduce some new hypotheses about the language and thought link to reading or call upon one of the theories Waterhouse has explicated.

The psychological reality of theories of language and thought is obviously a critical and complicated issue. In the second chapter, Karen Fischer focuses on the connection between universal competence claims of psycholinguistic theories and the actual language performance of children. The competence-performance distinction, as it has come to be called, is a recurring theme in psychology and education. It provides a way of thinking about the marked variations in pupils' reading performance.

In the final chapter, Ellen Ryan critically reviews the research evidence about the development of the child's awareness of language from the perspective of what level, if any, of linguistic awareness is needed for initial reading. While it is axiomatic to say that language and thought form a basis for reading, the issue here is specifically about how the child's thoughts about his language influence his reading performance. A prerequisite to resolving that issue is the investigation of how the child's cognition of language develops and

Ryan provides this in the third chapter of this monograph.

The series is organized around the notion that the child's reading behavior, among other things, is a developmental phenomenon. This means that, like other developmental phenomena, there are certain necessary and sufficient conditions for it and that it changes both quantitatively (it becomes faster and more efficient) and qualitatively (different and more complex models are needed to explain it) as the child ages. The series will examine the development of reading from the perspective of the perceptual, cognitive, neurological, and linguistic prerequisites for it; specific factors in its acquisition; and factors which lead to the enhancement of the reading skill once it has been acquired.

During the summer of 1974, the Society for Research in Child Development, with the support of the Grant Foundation of New York, sponsored a four week interdisciplinary institute at the University of Delaware on Reading and Child Development. The thirty-three institute faculty were researchers in the disciplines of psychology, psychiatry, education, linguistics, neurology, sociology, and the law. Each spent from three to five days at the institute, both formally and informally presenting the applications of their research to the field of reading.

The institute participants were advanced doctoral students and postdoctoral faculty from various disciplines who had an interest and commitment to research in reading. They were present for the full four weeks, and some of them are contributing authors to this IRA *Series on the Development of the Reading Process*.

The success of the institute, upon which this series is based, was due to the energies and talents of many people. In addition to the dedication of the particpants, faculty, and administrative staff whose names appear elsewhere in this issue, the staff of Clayton Hall and the Department of Educational Studies of the University of Delaware, and the members of the Long Range Planning Committee of the Society for Research in Child Development contributed substantially to the planning and execution of the institute.

Finally, the series itself was greatly improved by the editorial assistance of Lloyd Kline and Faye Branca of the International Reading Association.

Frank B. Murray

The Implications of Theories of Language and Thought for Reading

LYNN H. WATERHOUSE
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There are five intellectually compelling theories of the relationship of language and thought current today. They can be classified as the 1) Russian, 2) modified Whorfian hypothesis, 3) Piagetian, 4) psycholinguistic-experimental, and 5) semiotic extension theory recently proposed by McNeill (1974). The Russians—Luria (1969) and Vygotsky (1962)—have argued that a child's verbal behavior facilitates cognitive development. Whorf (1956), Sapir (1949), and others have argued that the structure and vocabulary of an individual's language determine the individual's understanding and perception of the world. Piaget (1965) theorizes that children's early cognitive concepts structure their understanding and use of language. Experimental psycholinguists, including Clark (1972), Bever (1970), and others, have more recently argued that there are basic cognitive laws which underlie aspects of both thinking and language behaviors. The semiotic extension theory, currently proposed by McNeill (1974), argues that an early developmental set of sensorimotor concepts becomes the base for later adult cognitive operations by functioning as schematic limitations for all mature speech production, no matter how complex the thought.

Albeit these five theoretical frameworks address differently segregated elements of mental and behavioral processes, nonetheless they share several basic heuristics: 1) the reification of measurable aspects of cognitive operations as "language" and "thought"; 2) the division of language behavior into three parts (internalized rules and associations, mechanisms for comprehension, and mechanisms for speech production); and 3) the division of thought into language-based and nonlanguage-based operations.

The comparative validity of these theories is extremely difficult to test. For one thing, the central arguments in all the

theories are about black box processes, and the relevant behavioral research studies offer both confirming and disconfirming evidence for claims from the theories. Neither language nor thought is well understood separately. Only very few languages have been well studied; and the functional structure of the most well studied language, English, is the subject of continuous theoretical controversy. Furthermore, the nature of a possible internalized set of rules governing language behavior is not clearly delineated.

The state of research on thinking is, if anything, more problematic than that done on language because there has not been the consistent theoretical framework for recent research in thinking as has been provided for research in linguistics by transformational grammar. Learning theory, gestalt theory, behaviorism, as well as theory on decision-making and problem-solving all provide data on the possible nature of mental operations which are called thinking.

Because of the state of knowledge about language processes and thought processes, and the difficulty of testing the validity of theories, there is some doubt that a model of the relationship between thought and language can be generated which is not a tautology or untrue (Chomsky, 1973). But while it is clear that the theories are underdetermined by the data which has been generated, this does not mean that a plausible theory cannot be, or has not been constructed already.

Even if a fully adequate theory has not been developed, the five hypothesized forms of the relationship between language and thought remain necessary, not only as attempts to explain language and thought, but also to serve as a base of explanation for other related human behaviors. The related behavior we are concerned with here is reading.

Reading and Language and Thought

Introduction

Any theory of the relationship between thought and language bears on the question of reading. First, reading requires language comprehension, some sort of semantic processing, and the ability to understand the meaning of the visual symbols which provide the form of language to be

comprehended. As such, reading must involve both a particular type of language behavior, and a special form of nonverbal thinking. Models of the reading process then must explain these elements either by introducing some new hypothesized relationship between language and thought or by calling upon one of the existing theories of such a relationship. The power of a model of the reading process will thus depend, in part, on the validity of the language-thought relationship specified in the model.

Second, and more importantly, from all present evidence it would appear that man's language and thought processes—however defined or modelled in any given theory—are universal skills which have had long development in the course of man's evolution (Alland, 1967; Lieberman, 1975), while man's ability to read is a recent and not yet universal skill. The fact that language and thought processes have evolved over a long time, and reading—though dependent upon language and thought—is a new cultural skill has been frequently noted (Lenneberg, 1967; Miller, 1972); but the implications of such a fact have never been carried very far. The implications, however, are very important: biologically adapted and culturally developed skills differ greatly, and any models of any complex behavior must account for patterns of variation in performance in terms of such adaption or development. Because reading is a cultural skill—but one which involves biologically adapted skills—it is essential to consider sources of control in behavioral variation before considering what models of the relationship between language and thought have to say about the reading process.

Evolution of Language Behavior

Though estimates of the origin of language in human behavior are tenuous, based on hypotheses about muscle attachments for oral motility in the surviving jawbones of our prehistoric ancestors, and upon the reconstruction of possible pharyngeal and laryngeal vocal cavities, it nonetheless seems clear that language must have begun in some form about one million years ago (Leakey, 1971), and have developed in a more elaborate fashion between 400,000 and 100,000 years ago

(Lieberman, 1975). Evidence of toolmaking and forms of social organization suggest that thinking was present in hominids long before the advent of speech. In any case, both thinking and language behavior were present very early on in the evolution of man.

Furthermore, at present we have other evidence for the continued course of evolution of language and thought in the findings for heritability of intelligence (Erlenmeyer-Kimling and Jarvik, 1964; Vandenberg, 1962), and heritability of language behaviors (Mittler, 1969; Waterhouse and Fischer, 1975). These findings indicate, generally, that individual performance variation in aspects of language behavior and test-measured intelligence is under genotypic control. These findings of heritability, or genotypic control of variation, in current population performance suggest that there has been some biological adaptation of such behavior through selection pressure in the course of human evolution.

Such biological adaptation can be very complex. Certainly the specific gene pathways of control for human behaviors is virtually unknown at the present time, and even purely behavioral models require many elements. Then too, different elements of an apparently unitary behavior such as "language" or "thought", through adaptation over time may have come to be under very different inter-relationships of innate and environmental influence, so that the apparently unitary behavior will really be a jigsaw puzzle of interlocking behavioral elements, each subject to differing influence from the environmental control (Lorenz, 1965).

Reading as a Part of Cultural Evolution

Unlike language and thought, reading behavior cannot be described with a model based on biological adaptation. Reading is an extremely recent development in the course of man's history, and there has not been enough time for specific biological adaptation. While some elite members of society 3,000 to 6,000 years ago could read, even kings in the middle ages signed their names with an X (Gelb, 1952). Mass literacy is a phenomena of the late 19th century and even now there are countries and areas with little or no literacy.

The problem in understanding reading is thus quite different from that of understanding language behavior or abstract thinking. While reading itself cannot be a biologically adapted skill, it still depends heavily on a set of biologically adapted skills, primarily the systems of (a) language comprehension, (b) visual perception, and (c) some cognitive-semantic skill to interpret abstract symbols. In addition, as has been said before, these evolved behaviors bring their own jigsaw puzzle complexity of units and varying control into the system or process. But the most difficult problem in understanding the reading process is the fact that reading, because it is a recently developed cultural skill, may therefore be so flexibly achieved a behavior as to be effected through different componential arrangements of those contributing evolved systems (Dobzhansky, 1962; Alland, 1967).

Thus reading, as a recently developed skill, involves biologically adapted skills, the interrelationships between which may vary both over the course of an individual's acquisition of reading, as well as across individuals who have learned to read.

We are all familiar with the phenomenon of people who can play some music they have heard but who cannot read music, and people who can read music, but who cannot play by ear. The behavior—playing the piece—is the same in both cases, but the source of the behavior is primarily auditory processing in the first case, and initially visual processing in the second.

Reading, like playing musical instruments, is a recent cultural skill in which information may be processed by multiple systems, and in which differing relationships among the systems may yield the same behavior.

Significance of Variability in Reading as a Cultural Skill

If there are variations in reading across individuals, such variation may include: (1) how the visual information is unitized (Gough, 1972); (2) whether or not the visual information is recoded to an auditory form; or (3) variation in possible output forms for the recoded visual information. If such

differing forms coexist in the population then the search for reading as a unitary process (by eye or ear, etc.) will never be resolved.

Current research does suggest an inability to resolve such problems. Research on whether language comprehension in reading requires auditory recoding or not is presently divided pro and con with no clear resolution. In addition, a summary of reading research done by Weintraub et. al. (1973) suggests that children's patterns in the acquisition of reading, as well as adult styles of reading, along with most forms of problems in reading all do show great variation across people. If there are many paths to the same goal, then some research controversies may evaporate: some readers may subvocalize—some may not; some readers may recode the written words as auditory input—some may not; and some readers may scan many times, few times, regularly or irregularly, and may perceive parts of words, whole words, phrases or sentences. Some readers may have many different ways to read—some may have only one scheme available to them.

If styles can vary, and the actual performance, reading with comprehension, can be adequately effected in a variety of ways, then the problem of what reading is must become the problem of what kinds of schemes of reading there actually are.

Overall, then, for a general model of reading there will most likely be specific areas of constraint (all readers share some set of skills), as well as specific areas of flexibility (some readers use a particular skill and others don't). If the process of reading as a nonevolved cultural skill does vary across individuals, and is a flexibly achieved behavior, then the first step in any model building will be an investigation, not of the areas of flexibility, but of the areas of constraint, which for reading have so far been hypothesized to be language, thought, and visual perception.

The following examinations of theories of the relationship of language and thought are made in light of their potential as a base component in a general model of the reading process.

Theories of the Relationship between Language and Thought

Introduction

The issue of language and thought arises at the point at which a reader's knowledge of the abstract symbols turns into language comprehension, and within the process of language comprehension, when a reader fully understands what he has read. What theories of language and thought say about language comprehension and understanding of abstract symbols thus should suggest some claims for the nature of the reading process. Each of the five current theories discussed briefly in the introduction—Russian, modified Whorfian, Piagetian, psycholinguistic-experimental, and semiotic extension—will be considered in terms of their possible contributions to an understanding of the reading process.

The Russians, Vygotsky and Luria

The Russian theory of the relationship of language and thought was developed first by Vygotsky (1962) in the 1930s, then by Luria (1961, 1969). Vygotsky did research on the development of children's conceptual systems, and claimed that words and symbols are units of labelling reality, and as such they are the means for the child's formation of general concepts. Vygotsky also argued that a word or symbol which represents an object not only cues a general concept—at the same time, for the child, the word or symbol exists as an attribute of the actual object. Both Vygotsky's and Luria's subsequent work reflects Pavlovian theory: they argue that stimuli which activate conditioned reflexes are the first signalling system, and language, which can label the stimulus, is the second signalling system.

Luria's contribution was the finding (now disputed) that complex motor behaviors in children appear to require verbal intervention by the child's repetition of the task instructions aloud. Older children, too, appeared to use language to help

themselves stop some well-trained behavior. This use of language, not only to interiorize general concepts, but also to interiorize control of motor behavior, for Luria operates in three stages: (1) the child vocalizes the verbal label or command; (2) the child subvocalizes the utterance, and (3) the regulatory function is transferred to the system of meaningful referents internalized from speech.

Applications of the Russian theory to reading. The Russian model of the relationship of language and thought has three possible implications for reading research. The first is that reading aloud should be the best system for initial acquisition of reading. At this stage in the child's development of conceptual relations, such relations are still mediated by speaking aloud, and thus reading aloud would be congruent with an ongoing system of acquiring concepts.

Secondly, for Vygotsky the child's comprehension of symbols and the child's comprehension of spoken words or verbal labels are identical processes, so for Russian theory the child's understanding of the grapheme-phoneme relationship resolves into the fact that the child can see the word and the verbal label both as attributes of the object to which the written word refers. If the child reads aloud, both the abstract language symbol (the written word) and the spoken verbal label mediate the same interiorized conceptual relationship. Thus models of the reading process should show visual and auditory input both channeled through the same process to the same point.

Third, in the course of the development of reading skill, according to Russian theory, a child should go from reading aloud to subvocalizing to complete dependence on the abstract symbol to activate the interiorized language. Tests might be done of children at different stages of acquisition in order to see if such a pattern does exist.

The Modified Whorfian Hypothesis

The Whorfian hypothesis (1956) argues that the structure of a language influences people's perceptions of the world. Recent research (Berlin and Kay, 1969; Heider and Olivier, 1972; Rosch, 1973; Cole and Scribner, 1974) suggests that for

the perception of color there are apparently natural categories which take primacy over the influence of the structure of any particular language's color terms (Berlin and Kay), and that across cultures, despite wide language variations, there are uniform cognitive processes—abstraction, inferential reasoning, and categorization (Cole and Scribner). Despite the attention-directing forms of any given language's system of verbal categories, and despite the variation in logical structure for different languages, nonetheless general human problem solving remains much the same across cultures.

The form that the Whorfian hypothesis takes in reading research is the idea that speech and written language are two truly separate forms of language with differing structures which will then involve different mental operations (Drieman, 1962). Arguments are not made that perception of the world will be different between the two, but that (1) either the process of mental operations or language comprehension will be different for each type of language, or (2) expectations made from the language of speech will not fit the language presented in the written material (Goodman, 1969).

The issue of just how different the language of speech and the language of writing may be involves three types of problems. The first problem is represented in the debate over whether spontaneous speech is generally well-organized (Labov, 1972), or is often not very well-organized (Chomsky, 1972). Clearly, the greater the degree of organization of speech, the less different writing and speech would seem to be.

The second problem involved in the issue of how speech and writing differ is the question of within-sentence and across-sentence complexity. The argument has been made by Miller (1972) that out of writing, logic was born. While it is true that relationships between assertions can more easily be expressed when those assertions are written down in linear form, and can be manipulated without specific need for memory storage, it is nonetheless true that many cultures in which there is no writing systematically used do have and use proverbs, sayings, and oral histories which do show evidence of complex logical structures (Hymes, 1964).

The third problem involved in the issue of the difference between speech and writing is the degree to which varieties of

speech are represented in written material. Black English, for example, has many grammatical forms which are not expressed in written American English. An internalized grammar based upon speech in Black English therefore should give rise to very different expectations about language than would be ideal for reading the printed page in Standard American English.

Though all three areas suggest forms of reading research, the most developed work has been that done on the third problem.

Reading applications of the modified Whorfian hypothesis. In reading research, the work of Goodman (1969, 1970, 1974) reflects this last problem clearly. He believes that the structure of the child's internalized language puts constraints on the child's input of new information through reading. For Goodman the child's language structure does limit the child's perception of the words on the page. Analysis of reading errors suggests to him that children internalize a grammar, or set of rules and expectations about patterns in language, based on their own speech. To the extent that written language goes against their rule-determined perceptual expectations about the forms of language, children will make a proportionate number of errors in reading. The greater the discrepancy, the greater the number of errors. Goodman's notions echo Whorf in the idea of the limits that one's own internalized language put on perception; in this case, perception of another form of language. As such, Goodman's theory is most powerful when applied (as he has done) to the reading problems of children whose internalized grammar and set of expectations are established in a dialect different than that of the reading texts.

Piagetian Theory

While the relevance of Piagetian theory to the problems of understanding reading was considered in the second monograph of this series, Piaget's theory of the relationship of language and thought is relevant to the present discussion. Piaget (1954) theorizes that children's acquisition of language is dependent upon the presence of sensorimotor schemas, or mental patterns for some motor behaviors. These mental

patterns for motor behaviors then become a cognitive schema, or pattern which allows the child to know how to reproduce that motor behavior, and understand that he has done so. For Piaget, the child's first words are dependent upon these early sensorimotor schemas in that early words reflect a verbal label for the stored cognitive schema. After this initial stage the child goes through the acquisition of social language and finally is able to use language to create complex, abstract and logical structures. This development is theorized as requiring cognitive schemas before verbal labels (Sinclair de Zwart, 1969).

The relationship of language and thought in this model is interactive. Initially a non-language conceptual scheme has to be present before a concept expressed in language may be attained, and the presence of concepts in language later helps set up the necessary cognitive differentiations for the understanding of a concept. In this model, thought as cognitive schemas and language as verbal labels begin as separate, interlinked systems, but through the course of development become indistinguishable.

Applications of the Piagetian scheme for reading. At the point at which reading begins, the Piaget model would predict that only material for which the child has already some conceptual scheme will be understood by the child. That is, aside from the mechanical aspect of doing the process of reading, only concepts for which the child is ready will be understood by the child. Furthermore, Piaget also distinguishes between a general understanding of the world, with experiential causal relationships, and an understanding of the logical relationships presented through language. For a child reading a particular passage, Piagetian theory would argue that to the extent that the serial sentences in the passage present syllogistic logic which is not based on any experiential knowledge of real world causation, the child will find the passage accordingly difficult to comprehend.

Beyond this, the visual symbol of the written letter or word and the speech that it represents must, for the Piaget model, be linked by some general cognitive schema which the child creates at the point of the acquisition of reading. This cognitive schema would express the meta-concept that the

visual perception of written words corresponds specifically to the speech the child has been encoding and decoding. This meta-concept or cognitive schema of the relationship of the written symbol to the spoken word is then a functional relationship: the schema controls the linking systems and is the source of the child's ability to read. The operation of this schema brings material into a point in the child's system of mental operations where the interaction of language and thought takes place. At this point, comprehension in reading is the same as that done in speech.

The possible validity of this application of Piagetian theory to the reading process may be tested 1) by the presentation of reading materials which incorporate varying logical structures and 2) by testing for the presence of the awareness of the linking meta-concept schema (although this latter may be extremely difficult to do).

The Model from Experimental Psycholinguistics

The linguistic theory of transformational grammar (Chomsky, 1965), and subsequent research on language behavior as it related to extended psychological claims from the model (Greene, 1973), has led to various theories of the perception of speech (Fodor and Garrett, 1968); implied theories of the process of speech production (Fodor, Bever, and Garrett, 1974); theories about the possible storage of sentences in memory (Savin and Perchoneck, 1965); theories about the relationships between sentences as they are processed for comprehension (Miller and McKean, 1964); and theories of the acquisition of language (Bever, Fodor, and Weksel, 1965; Brown, Cazden and Bellugi-Klima, 1968; and McNeil, 1966, 1970).

In the course of this research there has been a gradual movement away from the notion that there can be a one-to-one fit between the structure of the language (as envisioned by transformational grammars) and the kinds of processing or mental operations done with that language. In this movement away from belief in the temporality of transformations, there has been a somewhat greater consideration of possible general cognitive operations which may be the base for language behavior (Pylyshyn, 1973).

There have been a number of claims (Bever, 1970; Clark and Chase, 1972) that there is some general set of cognitive laws which determine both operations in language and in other mental processes which occur separately. The work of Clark and Chase suggests that the separation of language processes and cognitive processes is arbitrary. They argue from their findings that both language behavior and perception are subject to a common general interpretive system. This system applies unilaterally to all types of information coding no matter what the particular forms are. The researchers argue that this underlying system is a semantic one which operates to do the business of formal abstraction.

Bever (1970), like Miller and Chomsky before him, argues that the central abstract controlling system for all language behavior is an internalized knowledge of the grammar of the language. For Bever, actual speech behavior is a function of an abstract internal linguistic structure. This abstract internal linguistic structure in turn is a reflection of more general psychological universals:

> Many substantive linguistic universals appear to be derivable from more general psychological universals. For example, the universality of the noun/verb distinction in language might be explained as a linguistic reflection of the general cognitive distinction between objects and relations between objects (cf. Chomsky, 1965:28). Thus the concept of "noun" would not have to be taken as a linguistic universal in itself but merely as the linguistic expression of such a cognitive universal (Bever, 1970:351).

In any model which is based on these ideas, general cognitive laws—which operate in perception and in any nonlanguage understanding of the world—are seen to be the base of an internalized grammar, which in turn serves to control language behavior.

Reading applications of the psycholinguistic model. If applied to the problem of reading as a behavior involving language comprehension, this model would predict that there would be a universality in reading behavior, if the reading behavior were not affected by performance factors. For if there are general and universal cognitive laws, and those laws are expressed in language universals which are part of an

individual's internalized grammar, then to the extent that other systems involved are not impaired in any way, there should be a general equality in the comprehension of language done by means of reading. Furthermore, there will be only one way to effect this uniform performance—through the mechanisms theorized as universal for all.

While it is clearly not the case that all readers experience equal comprehension, by this model their differences in performance are attributable, not to any systematic differences across readers, but to variations in motivation, experience, and the like. The predictions for variation from this model then would be different from those predicted by Goodman (1970). In the Goodman model, variation is not so much to be attributed to performance factors as to an individual and group difference in internalized grammars across people. For Goodman the underlying cognitive universals are less important than the specifics of internalized grammars which may be different enough from the grammar of the written material to cause errors in reading.

The Semiotic Extension Theory

The central assertion of this model is that adults have speech production mechanisms which are limited in terms of their ability to express complex cognitive relations. McNeill (1974) sees the adult speech mechanism as not very different from the speech mechanisms of children, whose mental operations are at the sensorimotor and early representational stages. The limited speech production mechanism in adults is, however, used in the higher level conceptual processes. This is done by means of employing the limited mechanism while enriching it in order to express more complex concepts than can be done within the limits of the mechanism. McNeill's term for this borrowing and enriching is semiotic extension.

McNeill argues that

> Relying on the semiotic extension of the basic speech mechanisms, speech production is organized around such conceptual entities as Objects, Actions, States, and Events, regardless of the level of mental processing behind the content being expressed. Even abstract content, where there may not

be real objects, actions, states or events at all, must be organized into these sensory-motor structures. According to the theory given here, speech cannot be produced in any other way than from the use of the sensory-motor schemas as a guide, even though the speaker's mental processes may be organized at operational levels much different from the level of sensory-motor functioning (McNeill, 1974:1-2).

For McNeill the process of semiotic extension is necessary because in the evolution of human language and human thought there is a lack of any direct adaptation between speech and higher levels of cognition. This lack of a perfect fit between language and thought processes requires the intervention of the semiotic extension, and leads to two opposed tendencies in the relationship between speech and thinking: 1) the speech mechanism is enriched beyond its limits and 2) the extended use of speech mechanisms in thought allows for forms of distortion in cognition, when the cognitive operations are limited by the speech production mechanism.

This theory can best be understood as it serves to explain the course of the development of mechanisms for speech production. The developmental goal of children's passage through the sensorimotor and early representational stages (as per Piaget) is to express in words or verbal labels their internalized action schemas. While such action schemas are internalized as generalizations on motor patterns of behavior, once interiorized, they become the cognitive schemas which govern the child's ability to produce the patterned motor behavior, or concepts in language. Action schemas preexist interiorization—they are differentiated from overt action during interiorization but continue in their original schematic form.

McNeill argues that the child's speech production itself comes under the control of action schemas, which serve to provide information on the patterning of intonation, timing of speech flow, and the integration of speech units, as well as other information on physical speech production. For McNeill what is critical is that the child comes to have the ability to use the action schemas for speech. Through this mechanism the interiorized schema for the content or meaning of the child's

utterance guides, shapes, and serves to organize the schema for actual speech production. The particular shape or pattern of ideas which results from the interface of the content schema with the speech production schema is called the *syntagma* of the utterance.

The syntagma can be defined as the minimal unit of speech production based on meaning. The syntagma does not function in terms of the surface structure of sentences, or the propositional logic of sentences or the immediate transformational history of sentences. The syntagma is a functional scheme of organization of the relationships between general concepts such as objects, actions, states, and events within the physical and temporal flow of speech production. According to McNeill, "a syntagma thus unites the structure of meaning with the organization of articulation, and explains the latter [in part] by reference to the former" (McNeill, 1974:7).

The syntactical structure of a language in this model is seen as in the service of the production of syntagmas. Because the possible forms for syntagmas arise developmentally early, adult speech, however complex, finds a central core of syntagmatic expression which may limit or distort or enrich abstract expression. As syntax is in the service of the production of syntagmas, it either directly fits the possible straightforward expression of the schema's relations between objects, actions, states and events—in which case there is no lack of congruence between the syntax and the sensorimotor relational logic—or there may be some mismatch.

A syntagmatic/syntactic non-congruence may represent either 1) some mismatch between the structure of the language and the semantic relations the syntagma is intended to express or 2) some case in which a set of semantic relationships must be set up hierarchically, posing a problem for the structure of language which is linear. Whenever there is need for such complexity, as often happens in speech involving any form of abstraction, the intervention of semiotic extension, or the use of higher cognitive functions to dominate the use of syntax to express such schemas, is required.

There are two important types of data which support these theoretical claims: data from studies on hesitations in speech, and data from studies on gestures which spontaneous-

ly accompany speech. In this model, hesitations are predicted to arise in speech at points in the syntactical structure of the spoken sentence where there is a syntagmatic choice in the structure of the conception expressed in the sentence. Some evidence for this has been found, and is shown in individual studies of single sentences which have been tape-recorded from spontaneous speech. In such analyses it can be seen that subjects often pause in the production of a sentence at points where either a new syntagma is about to be introduced, or where the next main sub-part of the syntagma is about to be stated (McNeill, 1974).

In this theory spontaneous gestures are predicted to occur in correlation with the syntagmatic pattern of an utterance. In a task involving the subject's imagining that he is folding paper, the subject's representations of actions are accompanied by a verbal description and synchronous gestures in one-to-one relation to the envisioned action. Gestures appear to be initiated at critical points in the syntagmatic pattern of the utterance, notable at the point at which Actions or Objects are expressed (McNeill, 1974).

The McNeill model incorporates elements of Piagetian theory, refutes claims from the experimental psycholinguists, allows for a modified version of the Whorfian hypothesis (insofar as the speech production mechanism can distort and limit higher cognitive functions), and offers a detailed model for the developmental interaction of language and thought as their interrelation applies to speech production. No claims are made in this model for the existence or nature of possible forms of thinking which occur separately from the constraints of the speech production situation.

Application of the McNeill model to reading. There are a number of possible applications of this theory for reading. First, what is suggested here is that speech production follows a developmental pattern of acquisition incorporating as a base a limited set of semantic relations. Such semantic relations are based on sensorimotor schemas. Therefore it should follow that written material which preserves a close fit between the basic sensorimotor action schemas and the written word-flow will be more easily understood, and more easily read by the child.

Second, this theory would suggest that semiotic extension in written materials will be difficult, depending on the child's habit strength for the particular form of semiotic extension. When a particular meaning/speech production pattern is familiar to the child, then that material should be easier to read—when the syntagmatic pattern is unfamiliar, then the material should be difficult.

Third, reading errors are predicted to occur—not necessarily at clause boundaries (as the psycholinguists would say), but at the point at which either the syntagma takes an unexpected turn (as discussed above) or where the syntagma is totally unfamiliar, or where the separate syntagmas are known to the child, but the set presented in the sentence is simply too much for the child to process. When any one of these three things happen in reading, the reader is predicted to misread, hesitate, or shift to word-by-word reading.

Conclusion

None of the five theories considered here was postulated to explain any aspect of reading, nor were they specifically developed to account for the relationship of language and thought as they may be related in the process of reading. The application of such theories to the present question of the nature of reading does however generate some testable hypotheses: hypotheses which can be tested in both direct and indirect relationship to reading.

Of all of the five theories only one offers no directly testable hypotheses for reading—experimental psycholinguistics cannot predict variation or pattern in performance in reading because of the intervention of performance factors. Piagetian theory offers tests of comprehension according to a theory of conceptual development; the Whorfian hypothesis, as it is represented in Goodman's work, has been subject to a great deal of empirical testing of the effects of different internalized grammars; the Russian theory predicts a pattern of development from vocalization to subvocalization to interiorization which can be tested for in children's acquisition of reading. The McNeill model, which is one of the most explicit and

specifically predictive for our purposes, may be tested for by presenting varyingly organized written materials, and comparing reading performance with independently ascertained knowledge of the syntagmatic structures presented to the readers.

In any consideration of these possible testable hypotheses, it is important to remember that reading is a recent cultural skill, and as such it may be effected, not through any evolved, prewired or standard pathway, but through a number of variant pathways which are only constrained in terms of the requisite component systems of visual perception, cognition, and language comprehension.

In the five theories considered here, different allowances are made for variation. The Russians predict a nonvarying developmental sequence, the experimental psycholinguists predict functional uniformity varied only by performance factors, and the Piagetian theory allows for differing timetables of development across individuals, but argues that the processes are universal. The Whorfian hypothesis allows for group variation in terms of the group's language. The semiotic extension theory allows that every individual will have a wholly different set of syntagmatic relations, but that basic processes are the same across adults.

If the variation in reading is limited to the variation possible for recoding of incoming information, then any one of the five models of the relationship of language and thought might be incorporated into a model of reading without modification, but if the variant pathways reading can take will include a variation in the linkage of language and thought (internal to the recoding of information) then the variation allowed in each of the models will become critical for the general model of the reading process.

Before any new research is undertaken to test any of the hypotheses discussed here, however, it would seem important to examine earlier research. Previous research findings which show evidence of variation in process by readers in the studies should be reexamined. The presence of variation, when uniformity has been examined, may help to give a better picture of what types of reading really may exist.

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Metalinguistic Skills and the Competence-Performance Distinction

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Reading, on first appearance, would seem to be a most natural and universal skill. Children are expected to read at a much later age than the age when most master the seemingly more complex task of acquiring a language. The school age child has little difficulty in discriminating and labeling many types of visual stimuli. According to the common notion, learning to read is simply a matter of intermodal transfer; applying visually the processes readily available to the auditory modality. If reading involves just this small extra step of intermodal transfer, why can't Johnny read?

It is widely accepted that children have acquired language by school age, and that therefore reading dysfunction cannot have a purely linguistic basis. The linguistic skills needed in the speech setting, and those necessary for decoding the printed word, however, may not be entirely congruent. Indeed, a basic issue for researchers in reading involves the extent to which the child exposed to reading instruction has actually acquired the rule system of his language. Are there any limitations in the typical six-year old's production and comprehension of the grammar of English? Mattingly (1974) has raised the crucial issue of the role of "linguistic awareness" in learning to read. The speaker's ability to follow the rules of his language is not equivalent to conscious knowledge of rules. This conscious knowledge, or metalinguistic awareness, may be necessary to learn to read. If the child has not yet acquired a given rule, linguistic awareness can hardly be expected.

The idea that all young children possess substantially all of the complex rules of English grammar owes much to the writings of Chomsky (1968). Chomsky asserts that the child has innate knowledge of "linguistic universals," which are conditions to which all languages conform. This innate knowledge allows the child to infer the rule system of any

language, based on an analysis of the "degenerate" data to which the child is exposed in the language acquisition period. Although there has been substantial criticism of Chomsky's notions of innate ideas, and universal, species-specific language skills (see Derwing, 1973), these ideas have been very influential in psychology and education. Chomsky's followers have provided valuable insights into the similarities of natural languages and the presumed similarities of people's knowledge of the rules of language. To those concerned with possible sources of difficulty in poor readers, however, this emphasis may obscure important variability in language skills that contribute to reading dysfunction. Chomsky's idea that all native speakers are equally "competent" should be scrutinized. I hope to question this assertion, and suggest some possible ways in which school age children differ in language skills. The implications of these possible linguistic differences for reading will then be explored.

Competence and Performance

The ease of acquisition of the skill to produce utterances in compliance with complex rules has been remarked on by many. The casual nature of language acquisition has often suggested maturational processes (Lenneberg, 1967). Although most people are, in fact, quite skillful in terms of linguistic communication, at least in terms of community attribution of the presence of such skills, I think it important to try to consider possible limitations in linguistic performance. Basic to current thinking on linguistic performance is the notion of a competence-performance distinction.

This notion seems to be confounded in a number of ways and the terms have different implications when used by different writers. Chomsky (1965) makes a distinction between the ideal speaker-hearer's knowledge of or competence in his language, and performance, or the actual use of language in concrete situations. The generative and transformational grammar the linguist produces to describe a natural language is the basis of linguistic competence. Behavioral factors, such as memory limitations, inattention, etc., may cause the speaker to produce ungrammatical utterances in actual speech.

While Chomsky does not specify the way in which the underlying competence is tapped by performance processes, he does claim (1968) that "...the grammars that are in fact constructed vary only slightly among speakers of the same language, despite wide variations not only in intelligence but also in the conditions under which language is acquired." Katz (1964) also makes the strong claim that "variation in performance with intelligence...contrasts with the performance of speakers with respect to some purely linguistic skill, where no significant individual differences are found." In terms of performance, but especially in terms of competence, people are seen as possessing equal capability.

Greene (1972) asserts that the Chomskyan notion of *competence* can have either a weak or strong definition. The weaker definition merely asserts that grammatical competence provides a description of linguistic usage, without direct implications for how the rules of language production are related to the grammatical rules. The stronger notion states that the rules of grammar are in some way internalized and are an intrinsic part of *how* a person speaks. Many have objected to the assumption that rules discovered by formal linguistic analysis necessarily imply psychological processes used in speaking and learning a language (Staats, 1968). Bever (1970) states that "Grammatically defined *structures* may be reflected in speech behavior but not grammatically defined processes." Experiments, such as those of Fodor and Bever (1965) and others, have tried to demonstrate the psychological reality of various grammatical rules. The psychological reality of generative grammar is open to serious question. If the empirical evidence does not support the notion that underlying competence directly influences performance, we are at quite a loss to know what to "do" with this competence.

At the heart of the argument is Chomsky's claim of a universal, species-specific language acquisition device (LAD) that allows for the speaker's acquisition of fluency in his native language. While language is an "innate" behavior, it is dependent upon the proper environmental stimulation during the critical period of the early formative years (Chomsky, 1968). What the child brings to the language learning task are certain initial assumptions. Assumptions are a tacit knowl-

edge of linguistic universals, and may pertain to the syntactic, semantic, or phonological components of language. It is necessary, according to Chomsky, to assume that the child's language acquisition device contains knowledge of the formal and substantive universals of grammar, if one is to account for the child's acquisition of the rules of his language. Grammatical structure is not directly indicated in the surface structure, or actual physical acoustic signal of an utterance. The surface structure the child hears is not an accurate guide to the underlying relationships the child must acquire.

If one is to postulate innate notions on the nature of language structure for the young child, it reasonably follows that any normal adult, given the amount of exposure to and use of language that occurs during maturation, has had ample opportunity to learn the surface structure rules of his language. Substantially based on Chomsky's ideas of grammatical universals and innate ideas in the speaker-hearer, the notion of the universality of linguistic competence in nonimpaired humans has taken a strong hold. The differences in speech between people in the same language community are merely stylistic (performance) differences.

Exponents of this position state that all native, adult speakers seem to comprehend and produce similar syntactic structures, and make similar judgments as to grammaticality and non-grammaticality. Support for the equal competence position seems to rest on two slightly different assertions. One normally attributes to a speaker who is fluent the capability of producing the variety of sentence types of his language, although one may only overhear a small segment of the multitude of possible grammatical rules in the corpus actually examined. For rules actually observed in the speaker's production, one usually attributes possession of the rule if it appears only a small number of times. Instances of incorrect application of the rule are attributed to performance deficits, such as inattention. Linguistic performance is equivalent, and therefore competence is also universally equivalent.

One must question, however, the easy assumption of equal competence. Psychology has shown the importance of erroneous performance in understanding underlying cognitive structure. Even when the performance of children is correct by

adult standards, the children may take vastly different routes in producing a behavior. If shown balls travelling on parallel tracks, with the balls starting and finishing the track at the same time, both the preschooler and school age child may judge the balls as travelling at equal speed. If the balls are started on concentric circular paths at the same instant and finish the circles at the same instant, the young child may say the balls travelled at equal speed. The older child states that the ball on the outer path was going faster. The young child arrived at the correct answer in the first situation using a different cognitive strategy than the older child. The difference is revealed by the erroneous performance in the second situation. The younger child is in the pre-operational Piagetian stage of cognition, while the older child thinks in concrete operational terms. It is hazardous to assume that similar performance in some situations must imply equivalent underlying cognitive structures. It is equally foolish to ignore erroneous linguistic performance, as indicative only of the influence of "unimportant" factors. Perhaps the young child and the adult, producing the same acceptable utterance, have vastly different production strategies. It may be true that young children's errors are no different in nature than adults' but at present this thesis rests solely on assertion and casual observation, and not upon systematic examination.

Another assertion supporting the equal competence hypothesis is the notion that speakers of the same language must have substantially the same rule system, or communication would be impossible. In contrast, others maintain that different speakers in the same language community may have substantially different codes.

Bernstein (1967), for one, hypothesizes that the form taken by social relations is often transmitted in terms of certain syntactic and lexical selections. Different social classes are felt to have differential competency in use of elaborated codes. Critics of Bernstein point out that the differences he describes between social classes rests on frequency differences. Bernstein has been unable to demonstrate absolute differences in usage.

The speech style issue has also been debated in terms of dialect differences. The question is often phrased in terms of

Black English. Do children who speak Black English display linguistic differences from the majority, or linguistic deficit? Houston (1970) and many others argue the former position. They have convincingly demonstrated that the rules describing Black English speech are as complex and elegant as rules of Standard English. Indeed, linguists seem to be unanimous in the feeling that the grammars of all natural languages are equally sophisticated. It should be borne in mind, however, that the linguists' arguments have centered on the grammar of the various languages and dialects. All too often, the argument has been automatically extended to cover the speakers of a dialect. Because formal linguistic analysis finds the rules describing two dialects as equally complex, it does not logically follow that all speakers of either dialect are equally knowledgeable concerning the rules. It would seem to be a matter of empirical investigation to determine the extent and importance of individual differences in ability, both within and between language communities. Intuitively, within-community variation may be substantial, while between-community differences are probably undetectable.

Is the Knowledge of Language Innate?

When one begins to stress universal, invariant, species-specific patterns, the nativist position must be carefully scrutinized. A common trap is to reify traits into typologies. Species patterns are not typologies from which individuals vary (Dobzhansky, 1967). Traits are merely the abstractions from the variable phenotypes displayed by individuals in the population. Population genetics stresses the importance of understanding the nature and extent of phenotypic (and genotypic) variability. The prime data for understanding the "innate nature" of language is not the trait, language, but the variability in the trait, or individual differences in language performance.

Since individuality is all pervasive in nature, and most biologists have long rejected a typological approach (see Williams, 1963), it is unproductive to talk about an innate language acquisition device. At the least, one must reformulate Chomsky's LAD into a series of LADs, with major and minor

differences occurring between individuals in its structure. At the present, we are largely ignorant on the nature of the differences in skills people bring to the language learning situation. Postulating differences in skills, however, necessarily brings into question the universal competence assertion. Equal competence must rest on a universal, not particular, language acquisition device.

Psycholinguistic Reality of Internalized Grammars

An important approach for investigating the question of the link between actual performance, and the theoretical internalized competence postulated by the generative grammarians, has been the research on the psychological reality of various types of linguistic rules. Typical of this line is the work testing whether the complexity of transformation rules underlying a sentence correlates with psychological processing of the sentence (Savin and Perchonock, 1965; Slobin, 1966). Most investigators do not find the speaker-hearer processing sentences according to the processes postulated by transformational grammar.

McNeill (1974) has advanced an alternate theory of speech production. Speech production does not rest on the elaborate internalized generative grammar of Chomsky's theory, with speakers going from deep to surface structure via transformational rules. Production mechanisms are seen as similar to the cognitive processes involved in sensory-motor and early representational intelligence. Speech is organized around conceptional units, such as Objects, Actions, and States, that are formed at the sensory-motor level. Even in adults, speech is produced using these basic sensory-motor schemes, although the higher intellectual processes of adults may "borrow" these mechanisms. This process of borrowing, or "semiotic extension," often causes distortion in the basic thought process. McNeill attributes the philosophical error of regarding abstractions such as heat or force as entities, to the basic sensory-motor tendency of describing concrete situations. The process of semiotic extension, based on sensory-motor schemes, is necessary if one is to speak of these abstractions.

In thinking about things, as well as in the verbal encoding of thoughts, linguistic relationships are not an accurate guide to the mode of processing. For example, McNeill contends that in producing a negative sentence, the negation is present at the start of processing, and is not inserted after processing the assertion.

McNeill's theory states that linguistic performance is not based upon the abstract linguistic structure used to describe natural language by linguists. In fact, the basic organization of speech is the sensory-motor concepts acquired in early childhood. This idea is a fundamental challenge to traditional notions. Performance is not based on abstract linguistic structure, or even on such structures complicated by confounding factors such as inattention. If a transformational grammar is not needed to explain performance, what is the necessity of maintaining its reality to the speaker-hearer? One may insist that logic must be a reflection of thinking, but perhaps the thoughts leading to the logical analysis termed transformational grammar are confined to professional linguists, and are not part of the "competence" of most speakers.

McNeill's theories are quite useful in suggesting an alternate basis for speech production. He has also suggested an important distinction between child and adult speech. The link between language and thought is crucial. The adult, using higher order cognitive processes as the basis for his ideas, expresses them via a "semiotic extension" of sensory-motor schemes. The child, whose concepts are sensory-motor or early representational, does not use the "semiotic extension" to verbally express himself. One would expect substantial differences between adults and children in their fluency in using the speech production mechanism. McNeill would attribute many child errors in speech to a dependency on sensory-motor conceptualization. For example, in an actual action sequence, the intention to act precedes the action itself. There is cross-cultural evidence that children prefer the word order Agent-Action to Action-Agent (Bloom, 1970; Bowerman, 1973). This preference may account for the difficulty young children have with English passives. Perhaps it is only when children move past the sensory-motor stage, and their thoughts are not tied to their actual action sequences, that they

begin to be able to think, and hence speak, in terms of Action-Agent sequences. Just as there is a substantial variability in the age of attainment of the various Piagetian stages, there would be individual differences in age of attainment of language production capabilities.

In summary, the idea of universal, equal competence can be criticized in a number of ways. There is not strong empirical evidence linking actual speech production mechanisms to grammatically defined processes. Speakers producing similar utterances do not necessarily use similar production strategies, just as children faced with cognitive problems may give the same solution, although for vastly different reasons. Formal analyses of various codes or dialects, while revealing similarly sophisticated rules, do not address themselves to the question of the capabilities of users of the codes. Finally, variation is pervasive in all biological systems. It would be surprising if variability was not found in a hypothesized innate language acquisition device.

Individual Differences

What is the evidence on individual differences? Many have made the assertion that all non-impaired school age children are competent speaker-hearers. It is interesting to note that observers of child language find substantial differences in production between children of the same age. Where the evidence has been gathered, great variability is noted. Despite the observed variability many assume the same children who show substantial differences as toddlers and preschoolers, are substantially similar and competent at school age.

Investigators of school age children have had little difficulty in demonstrating differences in performance in various language skills (Chomsky, 1970; Clay, 1971; Menyuk, 1969). If a task is of intermediate difficulty for a given age—for example, only 50 percent of seven year olds are successful—one typically finds that many six year olds pass and many eight year olds fail. Indeed, adults show significant differences in ability to make judgments of grammaticality, to understand complex compounds or embedded sentences, etc. (Gleitman

and Gleitman, 1970; Schlesinger, 1968). The variability in performance is usually acknowledged, but is often seen as "non-significant" or not "central" to linguistic functioning. The question of the centrality of these linguistic deficits for ordinary functioning is open to examination. One obviously important and neglected area is the entire reading question. Kinsbourne (1974) has stated that reading disabled children are often deficient in purely linguistic skills. A simple comprehension task he administers to school age children is often failed by the reading disabled.

Extralinguistic Cues for Language Production

One possible important difference between mature and immature linguistic functioning is the importance of context cues for performance. Child language observers are always impressed with the concreteness of young children's conversation. Children talk about what they currently are observing, feeling and doing. McNeill's notion of linguistic performance, tied to sensory-motor, or concrete concepts, provides a basis for the observed output. Indeed, for the very young child, the immediate context may be overpowering in terms of speech production. A possible example of this is provided in a paper by Slobin and Welsh (1968), describing sentence imitations by a two year old. The child will spontaneously produce a fairly long and complex utterance, such as "If you finish your eggs all up, Daddy, you can have your coffee." If immediately presented her own utterance to imitate, she will successfully repeat the sentence. A ten minute delay in presentation of the model will result in an incorrect repetition, "*You* can have coffee Daddy, after." The child's speech performance is altered if the nonlinguistic context, including his own intentions, is altered.

Another example of context sensitive processing comes from Keeney and Smith (1971). The children observed had successfully imitated sentences with inflected verbs. The child says "The birds fly" and "The bird flies." If presented with the inflected verb on a comprehension test, however, the children choose a singular or plural subject at the chance level. The child who correctly produces an utterance may not be aware of

the referential implications of the syntactic markers he correctly uses. In ordinary conversation, the context may supply much of the meaning to the child.

Maratsos (1974) has investigated preschool children's comprehension of the missing subject of infinitival complement clauses. The child must choose the correct actor to carry out the complement verb action, for sentences such as "Susie tells Harry to get in the truck." Maratsos thinks his findings suggest that young children understand the intended reference of the infinitive verb through use of their understanding of the nonlinguistic context. Strohner and Nelson (1974) also investigated sentence comprehension strategies in preschoolers. Extra-syntactic strategies were used by three year olds, while the five year olds typically used syntactic information and correctly interpreted the sentences. Event probabilities (e.g., cats often chase mice) were among the strategies used to interpret active and passive sentences. Clark (1973) found some young children who used nonlinguistic strategies to comprehend locative terms.

Analysis of the child's production is not an accurate guide to his capabilities. Keeney and Wolfe did not overhear verb inflection errors in their children. Chomsky (1970), in asking her subjects to explain the meaning of a "promise," did not find that the children were using ungrammatical sentences in their explanation or had difficulty in explaining the meaning of the item, although comprehension tests revealed deficits in performance. Beyond a certain point in acquisition, children are quite adept at producing only acceptable utterances. Research I've conducted with Lynn Waterhouse on sentence repetition in twins (Fischer, 1973) shows both identicals and fraternals equally similar in the number of correct verb forms found in their repeated sentences. The correct forms, however, were often simplifications and reductions of the model, such as producing the present tense in substitution for the future tense. There may be strong environmental pressure for the production of "correct" output, without regard for the level of linguistic sophistication shown in the output. Noting that the child's language output is essentially correct may be an incomplete picture of his productive capacities.

The question is of equal importance for decoding skills. Adults, and even young children, are quite adept at matching their conversational complexity to different speakers' linguistic skills (Shatz and Gelman, 1973). Four year olds speak in simpler sentences to two year olds, than they do to other four year olds. In face to face conversations, especially with children, few speakers continue a conversation that is obviously not being "comprehended," at least at some level, by the listener. The speaker will back-track, simplify, or finally just change the topic if the listener is not giving the verbal and extra-verbal cues indicative of comprehension.

The importance of the speech setting for production has long been noted, especially in terms of style switching in the speech of minority children (Cazden, 1970; Hymes, 1968). Situational factors may be influential not only for style, but for grammatical skills as well. For young children, where the topic of conversation is usually inherent in the speech setting and where the other speech participants are quite skillfull in varying their output dependent upon signals of comprehension, there are many cues external to the code that convey meaning. We can only speculate on the importance of these extralinguistic cues for normal language functioning in children.

Similarity of Speaking and Listening to Reading

When one begins to emphasize the importance of extra-code factors to normal speech, especially for young children, one sees enormous differences between reading and speaking, at least at the ages most children are exposed to reading instruction. I would agree with Mattingly (1974) that "Speaking and listening are primary linguistic activities; reading is...secondary...." I wish to extend Mattingly's assertion, however, in terms of the previous discussion. For younger children, factors often termed "extralinguistic," such as the speech context, may be important for speaking and listening. As the speaker matures, he becomes less context dependent, showing greater capabilities to discuss and comprehend abstractions. In McNeill's terms, the "semiotic extension" is developed. If reading crucially involves a conscious awareness of primary linguistic activities, which I think it does, then

perhaps it awaits the child's maturing to non-concrete, context independent language processing. It is interesting to note, in this respect, that successful early readers and early reading instructional strategies, often rely upon the child to produce his own reading material (Read, 1971; Ashton-Warner, 1963). Perhaps the context cues typically absent from standard primers are supplied by the child.

Goodman (1970) calls reading a psycholinguistic guessing game. Skilled readers make errors because of incorrect, but logical, hypotheses about the grammatical rules of the phrase or sentence being read. Poor readers' errors are not logical extensions of the preceding words in the sentence. The poor reader's word by word analysis may not give him sufficient information to determine possible grammatical structure, or his linguistic skill may be insufficient for him to do so, given any amount of data. The child who is minimally dependent on extralinguistic cues for his own speech, and who shows some awareness of the formal properties of his speech, would be advantaged at Goodman's game. The poor reader may have a linguistic basis for his reading disabilities.

The development of skill in speaking and listening, and in reading, does not seem to involve similar processes. In learning a language, the child only gradually attains awareness of the abstract rules used to describe the formal properties of his production. Ability to judge grammaticality, or state linguistic rules, emerges gradually. Language acquisition is a process of going from the covert to the overt. The child slowly becomes overtly aware of rules covertly inherent in his production. Reading, in contrast, seems to be a quite different process. The child must take explicitly stated rules, such as letter-sound correspondence, and principles of English orthography, and internalize them. As reading becomes rapid and automatic, the use of rules becomes covert, rather than overt. The child's success in internalizing the strategies for reading may, at least in part, depend upon his overt awareness of the formal properties of language. Maturing of overt linguistic awareness may occur long after children's speech sounds "grammatical." There may be substantial individual differences in the age of acquisition of these secondary skills. A closer look is needed at the actual psycholinguistic skills needed to learn to read.

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Metalinguistic Development and Reading

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In recent years, researchers working within a psycholinguistic framework have repeatedly demonstrated the inadequacy of the traditional view of reading as two independent sequential stages, sound identification followed by comprehension of meaning (cf., Ryan and Semmel, 1969; Smith, 1973). In fact, meaning can be extracted from written sequences of words independently of their sounds, and often the meaning must be comprehended before the appropriate spoken form can be produced. The older viewpoint implied that the only new skill involved in learning to read was translation of letters into sounds since the meaning could presumably be derived from the generated sounds on the basis of ordinary oral language skills. The psycholinguistic approach, on the other hand, emphasizes the development of the active, deliberate meaning-seeking behaviors which are necessary in reading.

Related to this view, some specific hypotheses can be put forth concerning the relation between language competence and the acquisition of reading. In particular, Mattingly (1972) explained the contrast between the ease, universality, and naturalness of oral language learning and the apparent difficulty of learning to read by regarding reading as a "deliberately acquired language based skill, dependent upon the speaker's awareness of certain aspects of primary linguistic activity." The data in support of this proposal have been almost exclusively directed toward the relation between reading difficulties and the lack of phonological awareness (cf., Kavanagh and Mattingly, 1972).

The purpose of this article is to consider the proposition that awareness of the grammatical rules underlying language

[1]The author would like to express her appreciation to Dennis M. Scholl and Susan H. Ratwik for their contributions to this article.

may also be a prerequisite for the attainment of reading proficiency. In other words, as a deliberate language activity, reading may require a degree of linguistic awareness not necessary for speaking and listening effectively in everyday interactions. First, linguistic awareness (or metalinguistic knowledge) is defined as part of the general cognitive ability to utilize knowledge deliberately and consciously. Second, evidence is presented demonstrating that conscious knowledge of grammar and meaning increases throughout the preschool and school years. Finally, the possible relations between reading abilities and developing linguistic awareness as well as their implications are discussed.

Cognitive Interpretations of Metalinguistic Performance

Metalinguistic knowledge, or linguistic awareness, involves the ability to focus attention upon the form of language in and of itself, rather than merely as the vehicle by which meaning is conveyed. According to Vygotsky (1934/1962) and Cazden (1974), this ability to objectively analyze language structures lags behind speaking and listening performance because of the additional cognitive skills demanded. Furthermore, that children develop these cognitive skills at different rates can be inferred from differences in adult metalinguistic sophistication (cf., Gleitman and Gleitman, 1970).

While relating language to other school learning, Vygotsky (1934/1962) clearly differentiated between two stages of knowledge acquisition. First, a concept develops spontaneously and unconsciously and, second, often quite gradually, it comes under the child's active control. His claim that the abstract quality of written language is the major stumbling block to literacy can be understood in terms of this distinction. Since the written message is divorced from natural language settings and represents speech in a sketchy manner, the reading task requires deliberate control of various language characteristics.

Based upon detailed analysis of the internal structures and mental operations involved in the reading process, Posner, Lewis, and Conrad (1972) developed a cognitive framework

within which to view the need for linguistic awareness in reading. First, they defined consciousness as an attentional component which integrates signals from different modalities. They then proposed that their three subsystems of reading (visual processing, name code, and meaning) are coordinated by this limited capacity mechanism. Perhaps, then, the notion of inadequate metalinguistic ability (specifically, lack of the required conscious integration) might account for the failure to read of some children who can handle all the subskills.

Although stated differently, Downing's (1973) view of literacy acquisition as a problem-solving task also relates reading to other cognitive processes such as shifts in attention and strategy selection. Belmont and Butterfield (1977) have established that "executive functioning" (the ability to select, monitor, and revise strategies in a problem-solving task) improves as a function of age. Executive functioning, or deliberate cognitive control, provides a feasible interpretation of age differences found by Flavell (1971) in children's reactions when instructed to memorize and in their ability to generate mediators when appropriate for a memory task. Using interview techniques, Kreutzer, Leonard, and Flavell (1975) have related older children's active, flexible, and planful approach to memory tasks to their more sophisticated verbalizable intuitions about memory activities. The performance of the older group is a clear illustration of Vygotsky's second stage of knowledge acquisition (i.e., conscious control).

When developmental psycholinguists first began to translate Chomsky's theory of linguistics into a theory of language development (Bellugi and Brown, 1964), they were quite oblivious to the distinction between the level of knowledge represented by spontaneous rule-following speech and the level of knowledge tapped by linguists in the form of intuitions regarding the rules of the language. As deVilliers and deVilliers (1974) argue, one must consider the ability to apply structural knowledge deliberately as one of a variety of language performances which develop at different rates during childhood.

The following section of this chapter documents the developmental lag between spontaneous speaking/listening

skills and performance on linguistic awareness tasks. Although studies with very young children are included for completeness of coverage, the reader should pay particular attention to the implications for five- to seven-year-olds, the age group learning to read.

Evidence of Metalinguistic Development

Some evidence of increasing linguistic awareness is available in everyday speech behavior. For example, Slobin (1971) points out that three-year-olds frequently demonstrate a sense of grammaticality in spontaneous conversation. Whenever a child corrects his own speech (e.g., "Me do... I do it."), or the speech of another, one can infer that he is comparing the speech he produces and hears against a norm of correctness. In addition, Chukovksy (1963) and Cazden (1974) mention a variety of ways in which children spontaneously play with language: childish grammatical exercises in the crib, novel verses with topsy turvy meaning, nonsense chant play, and a variety of word games. What is needed, and what this section provides, is a review of the literature concerning children's ability to employ their language deliberately.

Cazden (1972) points out that, since becoming aware of knowledge is a continuing process, the experimental situation in which the child is asked to think about that knowledge can significantly affect research results. Differing task settings and requirements are especially important to consider, given the relatively low level of executive functioning (i.e., poor use of effective strategies) of young children. The tasks reviewed differ in the depth as well as in the type of linguistic knowledge tapped. One can consider various levels of awareness, from the minimal level of spontaneous rule-following behavior, to use of language strategies in processing distorted sentences, to categorical judgments regarding grammaticality, and finally to articulate explanations of rules or particular deviations from those rules. In addition, a wide range of linguistic rules of varying complexity have been investigated. Presumably, the level of awareness displayed by a child depends on both the specific characertistics of the task at hand as well as the particular aspects of linguistic knowledge which are relevant.

Syntactic Knowledge of Words

A number of studies have indicated that preschool and kindergarten children have difficulty isolating separate words presented in phrases or sentences. Huttenlocher (1964) found that four- and five-year-olds, who could reverse the order in auditorily presented two-unit sequences for letters, words of the same form class, and anomalous word pairs, had difficulty in reversing word pairs which formed common English sequences. It was pointed out that, in addition to being unable to separate English sequences into word units, the children were apparently concerned about the semantic absurdity of reversed pairs; they seemed unable to decenter from meanings. In a study by Holden and MacGinitie (1972), kindergarten children were required to tap a separate poker chip for each word as they repeated English phrases and sentences. Many of the children tended to ignore word boundaries between function words (e.g., *to, it,* and *the*) and the subsequent content words. Controlling for intonation, which typically highlights contentives, Ehri (1975) also found that preschoolers and kindergarten children showed little awareness of the independent lexical identity of function words.

In addition, Ehri's study involved a number of other measures of lexical knowledge. On all of the tasks, both preschool and kindergarten prereaders performed less adequately than first grade readers. The older children were better able to segment sentences into words and syllables, embed words in verbal contexts, and identify the word distinguishing two otherwise identical sentences. Furthermore, the first graders were better able to shift from one unit of analysis to another as in switching from syllable identification to word identification. The author suggested that superiority of the first graders on these tasks of lexical analysis may be a consequence of experience with the printed correlates of spoken forms through reading. The fact that young children are confused about the notion "word" is further supported by the interview tasks employed by Reid (1966) and Downing (1970). In summary, although word units are a necessary part of a speaker's knowledge of English, young children are often unable to employ that knowledge, especially for function words, in experimental tasks requiring word segmentation.

Berko (1958), in the first major study of children's linguistic awareness, required preschool and first grade children to supply English plurals, verb tenses, possessives, derivations, and compounds of nonsense words which were associated with verbal and pictorial contexts. Although the children's performance demonstrated their consistent use of morphological rules, their reponses for English words tended to be superior to those for the nonsense words. Furthermore, although the rules involved were used spontaneously by all the children, the first grade children performed markedly better than the preschoolers on the task. Thus, it seems that linguistic rules used successfully by a child in spontaneous speech become available only at a later age for deliberate application to nonsense syllables presented in a constrained testing situation.

The notion that metalinguistic skills develop later than linguistic skills may finally provide a reasonable explanation of the time gap between the child's displayed knowledge of syntactic features of words in everyday speaking and listening and his deliberate employment of that knowledge in word association, word sorting, and free recall tasks.

In his review concerning the acquisition of the concept of form class, Anglin (1970) discussed the effect which specific characteristics of a task can have on the measurement of a child's sensitivity to verbal contexts. In an early study, Brown (1957) found that three- to five-year-old children could point to pictures of things for count-noun nonsense syllables (*a sib*), to pictures of substances for mass-noun syllables (*some sib*), and to pictures of actions for verbs (*to sib*). On the other hand, in another study (Brown and Berko, 1960), even school age children showed great difficulty in abstracting the form class of a nonsense word from its use in verbal contexts. Anglin suggested that the visual representation and the nonverbal response required in Brown's earlier task allowed for successful performance without the active extraction of meaning from a verbal context; and hence, the required level of awareness of sentence structure was not as high in that task as in the second study.

Focusing on the design of a task which would enable children to display their knowledge about form classes, Bronson

(unpublished) showed that four-year-old children could categorize new nouns and verbs after learning to associate "thing words" with one colored shape and "action words" with a contrasting colored shape. However, the concrete basis upon which these children performed the task is illustrated by the fact that they had substantial difficulty with items such as *idea* and *grow*, which are less perceptually obvious.

In word-association tasks, a number of investigators (Brown and Berko, 1960; Ervin-Tripp, 1973; McNeill, 1970) have discussed the syntagmatic-paradigmatic shift which occurs in the early school years. Children gradually shift from a response pattern based on words that could follow the stimuli in a sentence to a pattern involving responses of the identical form class. The relatively late use of responses in the same form class can probably be attributed to the vagueness of the task and to the level of awareness required.

On the basis of clustering in word-sorting and free-recall tasks, Anglin (1970) has proposed that the features of words are gradually acquired from the most concrete to the most abstract. He suggests that, since clustering in sorting and free recall tasks is probably mediated by the internal verbal production of shared predicates, an individual must consciously "turn the language upon itself" in order to cluster in an adult fashion. Being a very abstract property, the form class of words should show up rather late as a basis for clustering or any other deliberate language task. For example, Anglin found that even junior high school pupils were generally unable to sort words into their primary form classes despite several years of explicit school instruction.

Carroll (1974) described an investigation involving words with several grammatical functions (e.g., *fair, fly,* and *tear*). Ninth graders showed greater ability than third and sixth grade pupils to employ words in a variety of grammatical roles, to interpret newspaper headlines, and to evaluate sentences with words in low-frequency versus incorrect sentence positions. Since most of the words are well-known by third graders and employed spontaneously by them in at least two grammatical contexts, the improvement in responses must be due to metalinguistic development rather than increased word knowledge *per se*. This study, in particular, underlines

the growth during school years of strategies for flexible, deliberate application of word knowledge.

Listening to Distorted Sentences

Children's reactions upon hearing distorted sentences can provide some indirect (if ambiguous) evidence of their awareness of the distortions. Shipley, Smith, and Gleitman (1969) investigated command-following behavior in children 18 and 30 months of age for well-formed and telegraphic (function words omitted) sentences. Whereas children using only single words usually obeyed the telegraphic commands better, the telegraphic speakers tended to obey well-formed commands. Assuming that children fail to obey commands which they perceive to be deviant, Shipley *et al.* interpreted the differential tendency to obey commands as an implicit judgment of the acceptability. Gleitman, Gleitman and Shipley (1972) point out that such a behavioral index of language judgments is probably only reasonable for two-year-olds. Older children are too sophisticated in that they can simply restructure the utterance internally and behave according to the intended meaning.

In contrast to this picture of two-year-olds being aware of the distinction between telegraphic and well-formed sentences, a number of studies outlined by Friedlander (1974) seem to establish the slow development (extending into the middle school years) of listening preference for well-formed meaningful sentences. In an attempt to study the communication status of non-referential aspects of the language, Wetstone and Friedlander (1973) presented two- and three-year-olds with simple questions and commands in a home play situation. The stimuli were spoken in varying degrees of word-order distortion to allow evaluation of the effectiveness of word order in children's comprehension of meaning. The majority of nonfluent speakers responded appropriately to all forms of the sentences, while the more fluent children's response scores were significantly lower only for those ungrammatical sentences which involved reordering of content words as well as function words. These data suggest that the young nonfluent child's receptive language processing is focused on

familiar semantic elements rather than on the syntactic framework and that even fluent three-year-olds pay little attention to function words. The authors suggest that, in listening to others, it may be that the child's attention is monopolized by his effort to understand the content of what is said, at the expense of attention to its grammatical form.

Bohannon and Friedlander (1973) report that in a study with children in kindergarten through fifth grade, the younger children showed very little critical listening ability, exhibiting no preference in a free listening task for a story with normal sentences over one with random word-order sentences. With unusual intonation cues (flat monotone for normal word-order and lively pattern for disordered), more of the children, especially at higher ages, showed preference for meaningful story material. It appears that the child is apt to respond to language by means of the semantic effectiveness of individual words rather than the underlying structure inherent in meaningful sentences. However, he must be sufficiently aware of the unusual character of the disordered material to be able to utilize additional distinctive cues to choose the normal speech.

In this investigation, then, young school children are found not to employ critical listening strategies in a rather ill-defined free-selection task. For them, syntactically correct sentences seem to be inadequately distinguished from disordered sequences. That the performance deficits noted in these listening studies may be related to reading deficits is strongly suggested by the strikingly high correlation found by Friedlander and Cohen de Lara (1973) between uncritical listening (lack of preference for clear versus noise-masked verbal material) and reading difficulties in the early grades. However, in the Friedlander work, two separate issues are confounded: whether word order plays an inconsequential role in the young child's interpretation of sentences and whether the child utilizes a nonmeaning oriented strategy in this vague selection task. Probably, a contrast of the comprehension of the well-formed material and of the disordered material would show a substantial advantage in favor of normal verbal material. Thus, the deficit of the young, immature child is most likely in his strategies. If a child continued to select disordered material equally often after instructions to concentrate on

meaning in preparation for a comprehension test, then one would be inclined to infer an inability to distinguish between the two types of material. On the other hand, if the child shifted toward normal sentences in a comprehension-oriented task, then Friedlander's work would have to be interpreted in terms of task requirements. Performance would then probably be improved by procedures intended to insure that a child was focused on active processing of information in all tasks.

Sentence Repetition

The use of controlled elicited imitations as a probe to discover a child's language abilities has gained strong support in recent years (Menyuk, 1971 and Slobin and Welsh, 1973). As Slobin and Welsh suggest, a fine-grained analysis of repetitions of systematically varied model sentences can reveal many otherwise hidden aspects of a child's language knowledge, including transformational rules and syntactic and semantic markers associated with individual lexical items. Although repetition can occur on a rote level, regeneration of the sentence form on the basis of its meaning is likely in spontaneous imitation and in elicited imitation if the stimulus exceeds the immediate memory span (Dale, 1972). The hypothesis underlying repetition studies is that the repetition of a sentence whose word length exceeds the immediate memory span should reflect the availability of matching structures in the subject's grammar. In her review, Menyuk (1971) states that accuracy of immediate recall of sentences can be affected by utterance length, lexical content, and phonological structure as well as by the target properties of syntactic and semantic structures.

Scholes (1969) asked three- to six-year-old children and adults to repeat word lists (with varying degrees of syntactic and semantic appropriateness) which were presented without any sentence intonation. The youngest children performed equally poorly on all lists of isolated words, even if the words actually formed a sentence. Adults and children over four and one half years appeared to be able to overcome the deviant suprasegmental cues and to concentrate on the grammatical features, depending on the degree to which such lists deviated

from grammatical strings. For the older children, string length also seemed to be a critical factor determining whether they first approached a string as if it were totally without meaning and structure. In a related study with real and nonsense words, Scholes (1970) found that three- and four-year-old children were more likely to delete function words, relative to content words, only when the content words were identifiable.

For sentences presented with normal intonation, Menyuk (1969, 1971) noted striking differences in the repetition of grammatical versus ungrammatical utterances by preschool and kindergarten children. Although word length and serial position affected performance with ungrammatical strings, they were irrelevant to the repetitions of grammatical strings. Most modifications of normal utterances preserved the original meaning, yet with a simpler grammatical structure. The structures correctly repeated by a child tended to be those produced spontaneously although there was some tendency for children to repeat a few structures which were first produced by slightly older children. As for ungrammatical stimuli, the youngest children most frequently corrected them *spontaneously* while the older children most frequently corrected them only *upon request*. Thus, the older children seemed to be able to note the deviance but follow the directions to repeat exactly. It would be interesting to know the extent to which children unable to correct deliberately still can notice the deviance. Also of interest would be an examination of a child's awareness of the difference between a complex target stimulus and his own grammatically simplified repetition.

Turning to tasks with school age children, McNeill (1970) reports a study in which three different kinds of word strings masked by white noise were presented for repetition to children ages five to eight. Immediate recall results showed a developmental increase in ability to take advantage of the semantic consistency of appropriate versus anomalous (grammatical but not meaningful) strings, but no age changes in the ability to take advantage of the syntactic cues available in the anomalous versus scrambled (neither grammatical nor meaningful) strings. McNeill explained the similar syntactic performance of all age groups in terms of the uniform use in spontaneous language of the requisite grammatical rules.

However, in an exact replication Entwisle and Frasure (1974) found a spurt between ages seven and nine in the ability to utilize the syntactic information available in anomalous sentences. In addition, similar findings resulted when all sentences were presented with word-list intonation, as in Scholes (1969). Such an increase in syntactic, as well as semantic, performance is highly consistent with the other data indicating developmental improvement in deliberate use of one's knowledge.

A related study by Weinstein and Rabinovitch (1971) found differences among good and poor-average fourth grade readers in their ability to utilize syntactic structure in a recall task. The stimuli were strings of nonsense syllables with grammatical inflections presented either in a structured or scrambled sequence. Whereas the good readers performed significantly better for the structured sequences, the poor readers performed approximately the same for both sequence types. These results are interpreted in terms of differential ability to generalize grammatical markers, to notice such structures, and to use them in novel situations. Clearly, these data provide additional evidence that less mature individuals tend to have a set for treating all non-language stimuli as equally nonsystematic and that cognitive development carries with it greater ability to apply language strategies to deviant utterances.

Judgments of Sentence Acceptability

Gleitman *et al.* (1972) describe the rudiments of metalinguistic functioning in three talented two and one-half-year-olds who could make some accurate judgments of *good* or *silly* for well-formed, reversed word-order, telegraphic, and reversed word-order telegraphic imperative sentences. All preferred normal word order to reversed, but only the linguistically most advanced child felt that telegraphic sentences were sillier than well-formed sentences. It should be remarked that all three responded less frequently to telegraphic commands in a previous study. Although two of the children were able to correct the sentences judged to be *silly*, only a small percentage of the corrections involved syntactic changes alone.

Noting the bias for semantic corrections in the Gleitman et al. study, deVilliers and deVilliers (1972) examined the judgments of eight two- and three-year-olds, who were asked to judge the acceptability of correct, reversed word order, and semantically anomalous commands and to correct any sentences which they called "wrong." Whereas all the children detected semantic anomaly, only the linguistically most advanced child (on the basis of mean length of utterance) could appropriately judge and correct reversed word order imperatives. The occurrence of correct syntactic categorizations together with inappropriate semantic corrections indicates that children at that stage may be only partially aware of correct syntactic form. DeVilliers and deVilliers (1974) emphasize the importance of corrections as necessary for distinguishing between the child who knows that a sentence violates the rules, whatever they may be, and the child who knows the particular rule which a sentence violates. This point is highlighted in a small study they report in which, despite a high correlation between appropriate categorical judgments and direct word-order corrections, three of twelve four-year-old *Ss* made 80 percent correct judgments with only a negligible number of syntactic corrections.

With regard to judgment abilities of young school children, the intuitions of seven selected children between the ages of five and eight were examined by Gleitman et al. (1972). All of them classified acceptable and subtly deviant sentences in conformity with adult judgments, and all gave interesting and relevant accounts of what was wrong with the deviant sentences, at least some of the time. Using a non-verbal response technique (pointing to probable speaker, adult or child), Scholl and Ryan (in press) found some ability among 24 five-year-olds and 24 seven-year-olds to distinguish primitive from well-formed negative and interrogative sentences. The performance, however, was far from the all-or-none judgments expected of adults. Due to the potential negative reinforcement value of the requirement to correct sentences judged as "wrong" or "childish," corrections were not included in this study. Thus, one can infer only that the children, especially the seven-year-olds, recognized that the ill-formed sentences were not adult but not that they knew what was childish about them. In order to establish full syntactic awareness and also avoid generating

a response bias, subsequent studies can request deliberate corrections or discussion of the sentences after all judgments have been made.

The intermediate stage of knowing that a particular structure is incorrect without knowing precisely the correct form is also illustrated by Cromer's (1970) examination of children's ability to understand sentences such as "John is easy to please." The youngest children always apply a primitive rule making *John* the subject of the verb *to please* while the older (over six) children know when *John* is the subject (as in "John is eager to please") and when it is the object even for nonsense syllable adjectives presented in only one differentiating sentence frame. There is an intermediate stage, however, during which children have learned that the primitive rule is occasionally wrong but have not yet acquired all the conditions for differential application of the subject and object rules in sentence interpretation.

Sociolinguistic Awareness

Awareness of speech style variations is one metalinguistic skill for which one would predict an advantage for children from language minority groups (e.g., Black and Mexican American). In their experience, the linguistic differences between speech styles employed in different situations are much more apparent than the subtle distinctions among speech styles for standard language speakers (Labov, 1972). In addition, due to the greater importance of improper use of dialect or language, the situational components affecting style shifts should be closer to consciousness at an earlier age.

Furthermore, knowing two language systems for communicating the same ideas should provide for a more objective, conscious view of one's own language as well as of language in general. In fact, learning more about one's native language is often a motivation for foreign language study in school. Cazden (1972) has suggested that the bilingual child should understand at an earlier age that the connection between the name of an object and the object itself is arbitrary. It is also probable that bilingual/bidialectal children are more aware of syntactic structures, by virtue of the contrasting systems they are learning. It is important to remark that the contrasting systems are only helpful if they have both been mastered on the

spontaneous level. In particular, Downing (1973) has pointed out that lack of spontaneous ability with the literate language will result in early reading difficulties.

Relation of Linguistic Awareness to Reading

As Gleitman (1974) noted, sophistication in metalinguistic tasks for both adults and children implies an ability to focus upon the surface syntactic form of a sentence. More generally, the essential feature of linguistic awareness is flexibility of strategy—ability to decenter when necessary away from the most salient attribute of a message, whether it be its meaning or its deviance from ordinary language. Whereas the meaning of the spoken utterance is more readily accessible than its structure, the structure of the written message must be analyzed deliberately before the intention can be extracted. It is reasonable to expect that the conscious control over linguistic forms exhibited in various metalinguistic tasks plays a role in the processing of abstract print.

Like the metalinguistic activities discussed in the previous section, reading differs from primary speech in that the utterances are isolated from their natural contexts. It is well known that the reading situation is divorced in time and place from the setting in which the message might have been produced spontaneously. In metalinguistic tasks, not only are the background meaning cues missing, but the very motive for speech, the need to communicate, is absent.

In addition, where communication may indeed be the goal (e.g., Friedlander's listening preference task), separation from the usual contextual setting inhibits adoption of the expected meaning-seeking strategies. Thus, even though adults view reading as a process of extracting meaning, children may often react more on a rote level to the task. For young children with little ability to apply language strategies where meaning is not naturally and obviously apparent, more explicit instructions and more meaningful reading tasks may be required in order to elicit the appropriate strategies.

In our review, a marked increase with age was described in the degree of deviance a child could tolerate before abandoning his linguistic strategies in the processing of

semisystematic utterances. The young child's tendency to treat even slightly deviant sentences as word strings would probably affect the learning-to-read process. The written representation of a message contains only a sample of the cues provided with the spoken message in ordinary conversation. In addition to facial and hand gestures, the intonation pattern superimposed upon a set of words often plays a critical part in the comprehension of heard messages (Lieberman, 1967; Lehiste, 1970). In the reading task, lack of this usual information may also lead the immature child to adopt a word-list, rather than a linguistic, strategy.

The identification of words, in silent reading and even in oral reading, requires more than knowledge of letter-sound correspondences. In particular, conscious awareness of the structural relationships represented in a sentence is also necessary. For example, in order to render into sound a non-homophonic homograph (e.g., *tear, live*, or *close*), the child must utilize sentential cues to form class as well as to particular meanings. The high level of accuracy in cloze tasks, which require an individual to supply words deleted from a text, further demonstrates the importance of structural and meaning cues for word identification. Guthrie's (1974) maze task, a multiple-choice cloze test, presumably serves as a successful training procedure precisely because it demands increased attention and makes effective reading strategies more explicit. In addition, the analysis of Latinate and Greek prefixes, suffixes, and roots for derivation of the meaning of unfamiliar words involves the application of conscious knowledge.

Executive functioning, the ability to select and revise appropriate strategies, plays an important role in determining a child's ability to adapt his reading strategies to task demands. For example, in oral reading the form of the printed message is highly important and even meaning-preserving alterations are to be avoided. Reading a novel for entertainment should elicit rapid meaning-oriented behaviors, whereas literary appreciation and criticism of the same novel would require detailed attention to style and form. Other types of reading material (e.g., scientific reports) demand elaborate

structural analysis for comprehension. Thus, mature reading is based upon a flexible approach which allows the reader to attend to different aspects of the message according to his goals.

On the productive side, writing is often considered an intellectualized version of speaking. Often more isolated from natural context than speech, writing requires greater care and attention to form, as well as the content of a message. Whereas the most common uses of speaking are impulsive and spontaneous, writing is usually a much more deliberate form of expression. Although a child may be unaware of the sounds he pronounces and the mental operations he performs in speaking, in writing he must pay attention to the sound structure of every word and deliberately put words into a certain sequence to form a sentence (Vygotsky, 1934/1962).

In fact, children are often asked in school to write sentences for each word in a list, often new vocabulary words. The difficulty often displayed by the youngsters may be due to the high level of linguistic awareness required by the task, rather than inability to use the words appropriately. In their investigation of verbal mediation, Turnure, Buium and Thurlow (1974) related linguistic awareness to young children's failure to profit in memory tasks from instructions "to generate a sentence" linking paired associates. Children under six years tended to respond to such directions with conjunctive phrases (e.g., the soap and the jacket) rather than with full sentences. In memory and writing tasks, these youngsters may not fully understand the abstract term "sentence" or they may be unable to imagine a meaning to fit the requested structure.

The program in English infant schools begun by MacKay and Thompson (1968) provides the best illustration of the importance of linguistic awareness for writing skills. This method provides each five- or six-year-old child with a folder containing word cards and a stand on which words from the folder can be set up as text. With this technique, a remarkable developmental progression has been noted in children's awareness of the structure of the sentence. In the first stage, the child simply lists words with no apparent link and reads them as isolated words. Later, he composes on his stand a

telegraphic sentence (with function words omitted), but reads it as a complete sentence. In the final stage, the child realizes that some words are missing and either adds them at the end or inserts them into proper grammatical position.

This performance is highly consistent with other metalinguistic studies illuminating the difficulty of young children in segmenting and identifying function words. Clearly, reading should lead to enhanced awareness of function words, as their status as separate and important words is highlighted in the written form of the language. The advantage found by Ehri (1975) of first grade readers over kindergarten prereaders in word segmentation tasks provides tentative support for such a hypothesis, although other age factors have not been excluded as an alternative explanation.

Summary and Conclusions

I have considered the proposal that a certain level of linguistic awareness is prerequisite to successful beginning reading. The improvement in children's metalinguistic skills during preschool and school years was reviewed for studies which used the processing of distorted sentences, sentence repetition, direct judgments, and deliberate corrections. In these tasks, since meaning is obscure or irrelevant and utilization of structural cues is necessary in both metalinguistic tasks and reading, poor performance in one activity should predict poor performance in the other.

Although a few studies suggest such a relationship, major research efforts should be directed toward illuminating the relationship between a young child's reading level and his ability in metalinguistic tasks which demand various degrees of awareness. Probably, reading performance will be more strongly associated with word segmentation and sentence repetition than with more demanding tasks such as syntactic corrections or explicit articulation of language rules. In other words, structural knowledge must be accessible for deliberate application, but it need not be totally conscious and verbalizable. Likewise, the acquisition of reading skills can be predicted to enhance metalinguistic knowledge, especially awareness of word units.

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